

FIG. 1

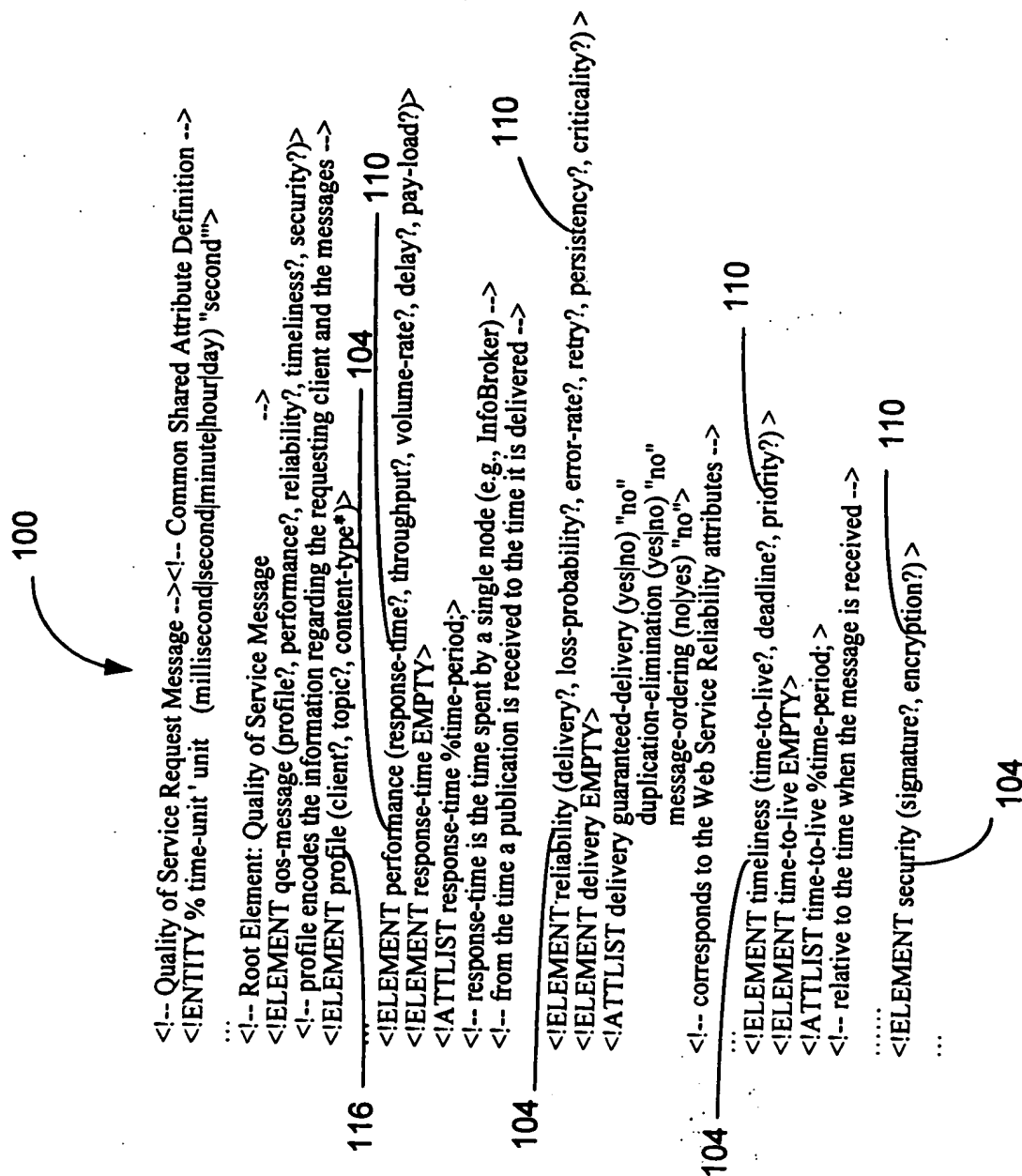


FIG. 2



Title: QUALITY OF SERVICE RESOURCE MANAGEMENT APPARATUS AND METHOD FOR
MIDDLEWARE SERVICES

Inventor(s): Guijun Wang, et al

Serial No. 10/797,523

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```
<?xml version="1.0"?>
<!DOCTYPE qos-message SYSTEM "QoSMessage.8.dtd">
<qos-message>
  <profile>
    <client name='Pub1' role='publisher'/>
    <topic>Logistics</topic>
    <content-type>text</content-type>
  </profile>
  <performance>
    <volume-rate unit='second'>100</volume-rate>
    <pay-load volume='32' unit='kilobyte'/>
  </performance>
  <reliability>
    <delivery guaranteed-delivery='yes'/>
    <criticality level='red'/>
  </reliability>
</qos-message>
```

FIG. 3





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```
408 public interface QosManager {  
    QoSContract establishQoSContract (String clientID, String qosMessage)  
        throws QosManagerChannelException;  
412    QoSContract reviseQoSContract (String clientID, String qosMessage)  
        throws QosManagerChannelException;  
416    void agreeQoSContractOffer (String clientID, QoSContract contract)  
        throws QosManagerChannelException;  
420    void abortQoSEstablishment (String clientID, QoSContract contract)  
        throws QosManagerChannelException;  
}
```



400

FIG. 5

```

sequenceDiagram
    participant 502 as CLIENT
    participant 308 as GoS MANAGER
    participant 312 as ESTABLISHMENT SERVICE
    participant 316 as POLICY MANAGER
    participant 324 as PREDICTION SERVICE
    participant 320 as RESOURCE MANAGER
    participant 328 as OPERATION SERVICE

    502->>308: ESTABLISH
    activate 308
    308->>312: ESTABLISH
    activate 312
    312->>316: ADMIT?
    activate 316
    316->>324: PREDICT
    activate 324
    324->>320: RESERVE
    activate 320
    320->>328: OPERATE
    activate 328
    328->>320: 
    deactivate 328
    320->>324: 
    deactivate 320
    324->>316: 
    deactivate 324
    316->>312: 
    deactivate 316
    312->>308: SUCCEED
    deactivate 312
    308->>502: AGREE
    deactivate 308
    502->>308: READY
    activate 308
    308->>312: 
    deactivate 308
    312->>316: 
    deactivate 312
    316->>324: 
    deactivate 316
    324->>320: 
    deactivate 324
    320->>328: 
    deactivate 320
    328->>320: 
    deactivate 328
    320->>324: 
    deactivate 320
    324->>316: 
    deactivate 324
    316->>312: 
    deactivate 316
    312->>308: 
    deactivate 312
    308->>502: 
    deactivate 308
    502->>308: 
    deactivate 502
  
```

Sequence diagram 500 illustrating a process flow involving multiple components: CLIENT (502), GoS MANAGER (308), ESTABLISHMENT SERVICE (312), POLICY MANAGER (316), PREDICTION SERVICE (324), RESOURCE MANAGER (320), and OPERATION SERVICE (328). The process begins with the CLIENT (502) sending an ESTABLISH message to the GoS MANAGER (308). The GoS MANAGER (308) then sends an ESTABLISH message to the ESTABLISHMENT SERVICE (312). The ESTABLISHMENT SERVICE (312) sends an ADMIT? message to the POLICY MANAGER (316). The POLICY MANAGER (316) sends a PREDICT message to the PREDICTION SERVICE (324). The PREDICTION SERVICE (324) sends a RESERVE message to the RESOURCE MANAGER (320). The RESOURCE MANAGER (320) sends an OPERATE message to the OPERATION SERVICE (328). The OPERATION SERVICE (328) returns a message to the RESOURCE MANAGER (320). The RESOURCE MANAGER (320) returns a message to the PREDICTION SERVICE (324). The PREDICTION SERVICE (324) returns a message to the POLICY MANAGER (316). The POLICY MANAGER (316) returns a message to the ESTABLISHMENT SERVICE (312). The ESTABLISHMENT SERVICE (312) sends a SUCCEED message to the GoS MANAGER (308). The GoS MANAGER (308) sends an AGREE message to the CLIENT (502). The CLIENT (502) sends a READY message to the GoS MANAGER (308). The GoS MANAGER (308) returns a message to the ESTABLISHMENT SERVICE (312). The ESTABLISHMENT SERVICE (312) returns a message to the POLICY MANAGER (316). The POLICY MANAGER (316) returns a message to the PREDICTION SERVICE (324). The PREDICTION SERVICE (324) returns a message to the RESOURCE MANAGER (320). The RESOURCE MANAGER (320) returns a message to the OPERATION SERVICE (328). The OPERATION SERVICE (328) returns a message to the RESOURCE MANAGER (320). The RESOURCE MANAGER (320) returns a message to the PREDICTION SERVICE (324). The PREDICTION SERVICE (324) returns a message to the POLICY MANAGER (316). The POLICY MANAGER (316) returns a message to the ESTABLISHMENT SERVICE (312). The ESTABLISHMENT SERVICE (312) returns a message to the GoS MANAGER (308). The GoS MANAGER (308) returns a message to the CLIENT (502).



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```
public abstract class Resource {  
    protected boolean sharable;  
604  
    public static Resource create(QoSContract contract, Element config, Class clazz) throws ...;  
644  
    public void attach(QoSContract contract) throws ResourceException;  
608  
    public void configure(QoSContract contract, Element config) throws ResourceException;  
    public void reconfigure(QoSContract contract, Element config) throws ResourceException;  
616  
    public void cancel(QoSContract contract) throws ResourceException;  
612  
    public void commit(QoSContract contract) throws ResourceException;  
628  
    public void release(QoSContract contract) throws ResourceException;  
  
    public void activate() throws ResourceException;  
620  
    public void freeze() throws ResourceException;  
624  
  
    public Prediction predict() throws ResourceException;  
632  
    public void register(QoSContract contract, Monitor monitor) throws ResourceException;  
636  
    public void unregister(QoSContract contract, Monitor monitor) throws ResourceException;  
640  
    public void adapt(QoSContract contract, Adaptation adaptation) throws ResourceException;  
}
```

FIG. 7